VENEER CUTTING OF WESTERN JUNIPER

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Introduction

There are thirteen species of junipers native to the United States, most of which are found in the arid western part of the country. It is estimated that these junipers, principally alligator juniper (Juniperus pachyphlaea) and Utah juniper (Juniperus Utahensis) occur on approximately 35 to 40 million acres in Arizona and New Mexico.

Alligator juniper is a small tree 30 to 50 feet high with a short trunk which occasionally may measure three feet in diameter. While it may occur in pure open stands, this juniper usually is associated with nut pine and Arizona and Emory oaks. The heartwood is slightly fragrant, close grain, brittle, and light reddish-brown in color with occasional yellow streaks.

Utah juniper is a bushy tree, rarely exceeding 20 feet in height and 20 inches in diameter. It occurs generally with other species of junipers, live oaks, and nut pines. The heartwood is light brown in color, slightly fragrant, soft, close grain, and brittle.

The utilization of the western junipers is ~~now~~ largely limited to fence posts, fuelwood, and novelty items. In an effort to find additional uses for these junipers, several logs of each species were cut experimentally into veneer, and the character of the veneer examined with a view for possible uses. This report gives the results of these tests.

Source and Description of Material

Three western juniper bolts from the Coconino National Forest were received at the Forest Products Laboratory in July 1951, where they were cut into rotary veneer. One bolt was alligator juniper, and the other two were identified in the field ~~from needle characteristics at the time of cutting~~ as Utah Juniper. These bolts are shown in figure 1 and described in table 1. All 4 bolts were of average quality and contained one or more seams with intergrown bark pockets and small to large branch stubs. Bolts No. 2-1 and 2-2 were cut from the same tree, and both had evidences of bird peck which did not penetrate deep enough in the wood to cause any damage to the veneer.

Two alligator juniper bolts and two Utah juniper bolts were shipped by Mr. A. C. Whiting, Holbrook, Arizona, to The Lane Company, Altavista, Virginia, in August 1952, for cutting into sliced veneer. Since the two bolts of each species were similar in size and growth characteristics, the data on only one bolt of each species is given in table 1. These same two bolts are shown in figures 2 and 3. Although cambium and wood-boring insects were active in both species, the larvae had penetrated only slightly in the wood with no deterioration to the veneer. End checks ~~had developed in~~ extended about 3 inches in the ~~four~~ ends of all bolts. Similar to the bolts that were rotary cut earlier at the Forest Products Laboratory, the bolts ~~sliced~~ had seams with intergrown bark pockets and several small to large branch stubs.

Preparation of Logs for Cutting

The bolts rotary cut were end-trimmed and heated in water at 160°F. for 2 days during which time several small end checks developed.

Table 1. - Description of juniper bolts rotary cut at the Forest Products Laboratory and sliced at The Lane Company

	Rotary Cut[1]				Sliced[2]	
	Bolt No. 1-1	Bolt No. 2-1	Bolt No. 2-2	Bolt No. 3-1	Bolt No. 4-1	Bolt No. 5-1
Diameter						
Small end - inches	8	8	8.5	12	13	12
Large end - inches	8.5	8.5	9	13	-	-
Length - inches	40	27	26	38	99	98
Eccentricity - inches	2	1.5	.5	1.5	.5	2
Average width of sapwood - inches	2.5	1.5	2	1.5	1.5	2.5
Rings per inch - average	21	30	30	30	21	18
Total number of rings	83	-	119	179	270	210
Moisture Content[3]						
Heartwood - percent	27	22	22	35	-	-
Sapwood - percent	156	114	114	103	-	-
Specific Gravity[4]						
Heartwood	.52	.54	.54	.51	-	-
Sapwood	.47	.47	.47	.48	-	-

1/ Bolt No. 3-1 is alligator juniper. Other bolts not identified. Bolts No. 2-1 and No. 2-2 are from the same tree.

2/ Bolt No. 4-1 is alligator juniper, No. 5-1 is Utah juniper.

3/ Based on oven-dry weight.

4/ Based on green volume and oven-dry weight.

These end checks, however, were not severe enough to be considered defects. The bolts conditioned in water at 160°F. were found to be suitable for the species with respect to tightness, and for softening the knots to prevent cutting through knots without nicking the lathe knife.

The bolts sliced were first flitched; e.g., slabbed on three sides with a circular saw and one bolt of each species heated in water at 180°F. for 48 hours before slicing. The remaining 2 bolts were not heated before slicing. Heating at 180°F. for 48 hours apparently had no injurious effect on the bolts or on the resultant veneer. Utah juniper appeared to be slightly softer than alligator juniper, but the difference was slight and had no effect on the cutting operation.

Veneer Cutting

Bolt No. 2-1 was cut into 1/16-inch veneer and bolts Nos. 1-1, 2-2, and 3-1 into 1/32-inch veneer using the lathe settings given in table 2.

Table 2. - Lathe settings used to rotary cut western juniper veneer

Veneer Thickness	Knife Angle		Nosebar Openings	
			Horizontal	Vertical
Inch	Degrees	Min.	Inch	Inch
1/16	90	10	0.055	0.016
1/32	90	35	.028	.012

All of the rotary-cut bolts were cut in a lathe equipped with 3-inch spindles and chucks. This permitted cutting approximately to a 3-1/2-inch core diameter. Bolt No. 3-1 broke in the lathe at a 5-inch diameter, and bolt No. 2-2 at a 3-1/2 inch diameter. Vibration of the bolts during peeling

probably caused by the excessive overhang of the small-diameter spindles, resulted in some rough cutting. This vibration was also accentuated by the bark seams present in the bolts.

During the cutting, it was observed that fine checks often developed on the bolts in the short-grain areas around the knots. Naturally, these checks were also in the veneer, extending in from the tight side which made the veneer hard to handle without breakage. The checks of this type were probably caused by the brittleness of the wood, particularly where the knife cut through diagonal grain areas. Such checks have not been observed at these areas on other species.

None of the bolts yielded any clear veneer in widths greater than 6 inches. A large percentage of the total veneer consisted of sapwood, and in 3 of the 4 bolts the sapwood was still encountered at the 3-1/2-inch core. Figures 4 to 6, inclusive, show typical veneer sheets obtained in the cutting.

The sliced veneer was cut 1/22-inch thick, ~~or~~ (the same thickness commonly used in slicing eastern redcedar) ~~and~~ at a speed of 28 strokes per minute. The heated bolts sliced satisfactorily, and the veneer compared favorably in quality to that of eastern redcedar ~~insofar as~~ with respect to surface smoothness and cutting characteristics. The unheated bolts, however, sliced and dried poorly with considerable checking and warping. Figures 7 to 9, inclusive, show typical sliced veneer sheets.

Veneer Drying

The moisture content of the green juniper heartwood averaged 28 percent while that for sapwood was 124 percent. The drying schedules given in table 3 were used for drying the rotary-cut veneer to a final moisture

content of 2 to 4 percent in a mechanical-type drier at 250°F.

Table 3. - Drying schedules for western juniper rotary-cut veneer

Veneer Thickness	Temperature in Drier	Time in Drier
Inch	Degrees F.	Minutes
1/16 sapwood	250	15
1/16 heartwood	250	10
1/32 sapwood	250	8
1/32 heartwood	250	6

Drying to a moisture content of 2 to 4 percent moisture content caused the 1/32-inch veneer to be very brittle and split readily when handled. Splits in the veneer opened in drying. The intergrown knots developed shrinkage splits, and the loose knots fell out during drying. Tangential shrinkage during drying to 2 to 4 percent moisture averaged about 6 percent of the green width.

Some of the sliced veneer was kiln dried with eastern redcedar to a moisture content of 12 percent. The veneer dried satisfactorily on the schedules used for eastern redcedar.

Veneer Characteristics

The logs of all species of western juniper contained both small and large live and dead knots. Live knots over one inch in diameter checked during drying, while dead knots over one-half inch in diameter became loose and fell out. It was common for both small and large dead knots to be encased with bark, which would be considered a defect even though they did not become loose and fall out.

The short grain wood around large live knots also checked and split during the seasoning process in both rotary and sliced veneer. Because of

these various defects resulting from large knots, bolts containing them should be avoided when possible.

The fairly large bands of sapwood resulted in a high proportion of sapwood veneer in both types of cutting. While this light-colored veneer contained less defect than the heartwood veneer, it probably would be less desirable for many uses because of the lack of color and grain characteristics.

The heartwood veneer, on the other hand, had a pleasing figure, although it probably will not be used in the place of eastern redcedar because of color and odor differences. Eastern redcedar heartwood generally is a deeper red color with a purplish tinge, while the Arizona junipers tested are brownish in color, sometimes interspersed with streaks of yellow. The odor of eastern redcedar is more pronounced, and generally more fragrant.

Some of the rotary-cut veneer was glued into plywood panels using yellow-poplar cores and juniper faces. No problem in gluing techniques was encountered, and it is expected that either rotary or sliced veneer can be bonded equally well without difficulty.

These tests indicate that the species of western junipers tested can be rotary cut or sliced satisfactorily using the methods described in this report. The bolts heated in water from 160°F. to 180°F. were found to be suitable for the species with respect to tightness, and cutting through knots. While the veneer cut was ~~found~~ not to be satisfactory for use in place of eastern redcedar for chests, it is entirely possible that uses for it can be found for furniture, paneling, and containers. Bolts with large knots and bark seams, however, should be avoided, since these defects limit the amount of usable veneer. Finishing tests conducted on the rest by the Forest Products Laboratory showed that both species lend themselves excellently to standard natural finishing techniques.

Considered

Figure 1. - Western juniper bolts tested at the Forest Products Laboratory. Bolt on left is alligator juniper (No. 3-1), bolt second from left unidentified (No. 1-1), and the two bolts at the right are from the same tree and also unidentified (Nos. 3-1 and 2-2).


WESTERN
JUNIPER
M 88017 F

Figure 2. - Alligator juniper (right, Utah juniper (center), and eastern redcedar (left), showing character of logs sliced into veneer.

Figure 3. - End views of Utah juniper (upper) and alligator juniper (lower) showing ring pattern, knots and bark seams.

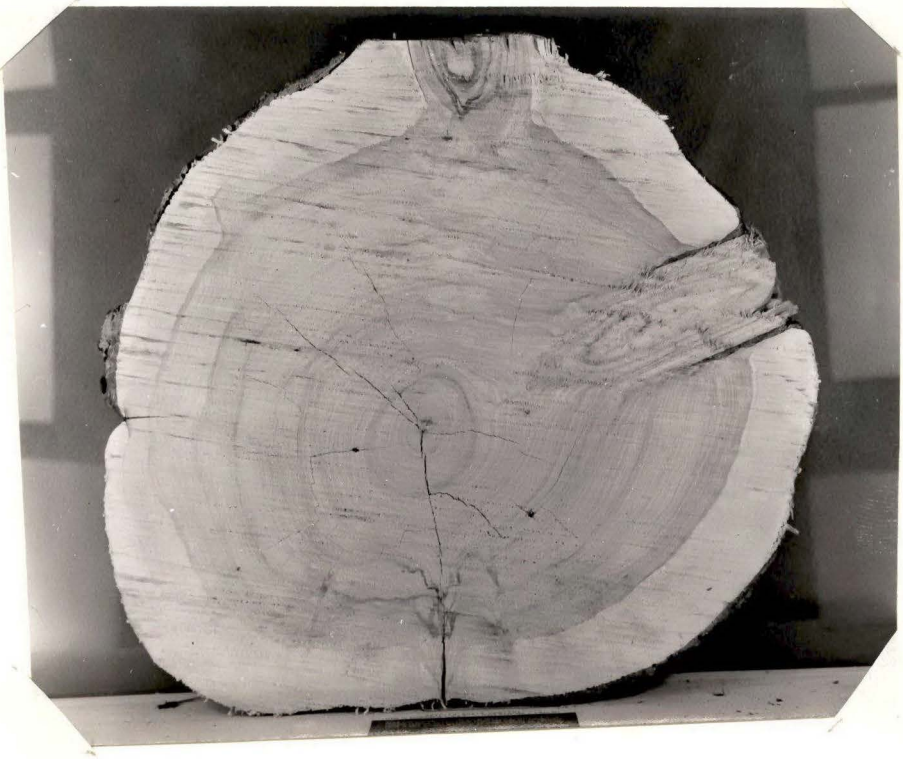

Figure 4. - A sheet of 1/32-inch rotary-cut veneer from near the core of bolt No. 1-1 showing:

A. Sound sapwood
B. Sound heartwood
C. Sound intergrown knot
D. A knot hole
E. Split in veneer sheet


A
B
C
D
E
1 2 3 4 5 6
WESTERN
JUNIPER
BOLT 1-1
DIA. 5 IN
M 88231 F

Figure 5. - A sheet of 1/16-inch rotary-cut veneer from near outside of bolt No. 2-1 showing:

A. Sound sapwood
B. Sound heartwood
C. Bark pocket
D. Large knot with shrinkage crack
E. Dead knot with encased bark which dropped out during drying


B
E
C
A
D
1 2 3 4 5 6
WESTERN
JUNIPER
BOLT 2-1
DIA. 6 IN
M 88230 F

Figure 6. - A sheet of 1/32-inch rotary-cut veneer from near the outside of bolt No. 3-1 (alligator juniper) showing:

A. Sound sapwood
B. Sound heartwood
C. Intergrown knot with checks in adjacent cross grain wood
D. Knot hole where dead knot fell out
E. Large split resulting from bark seam in veneer

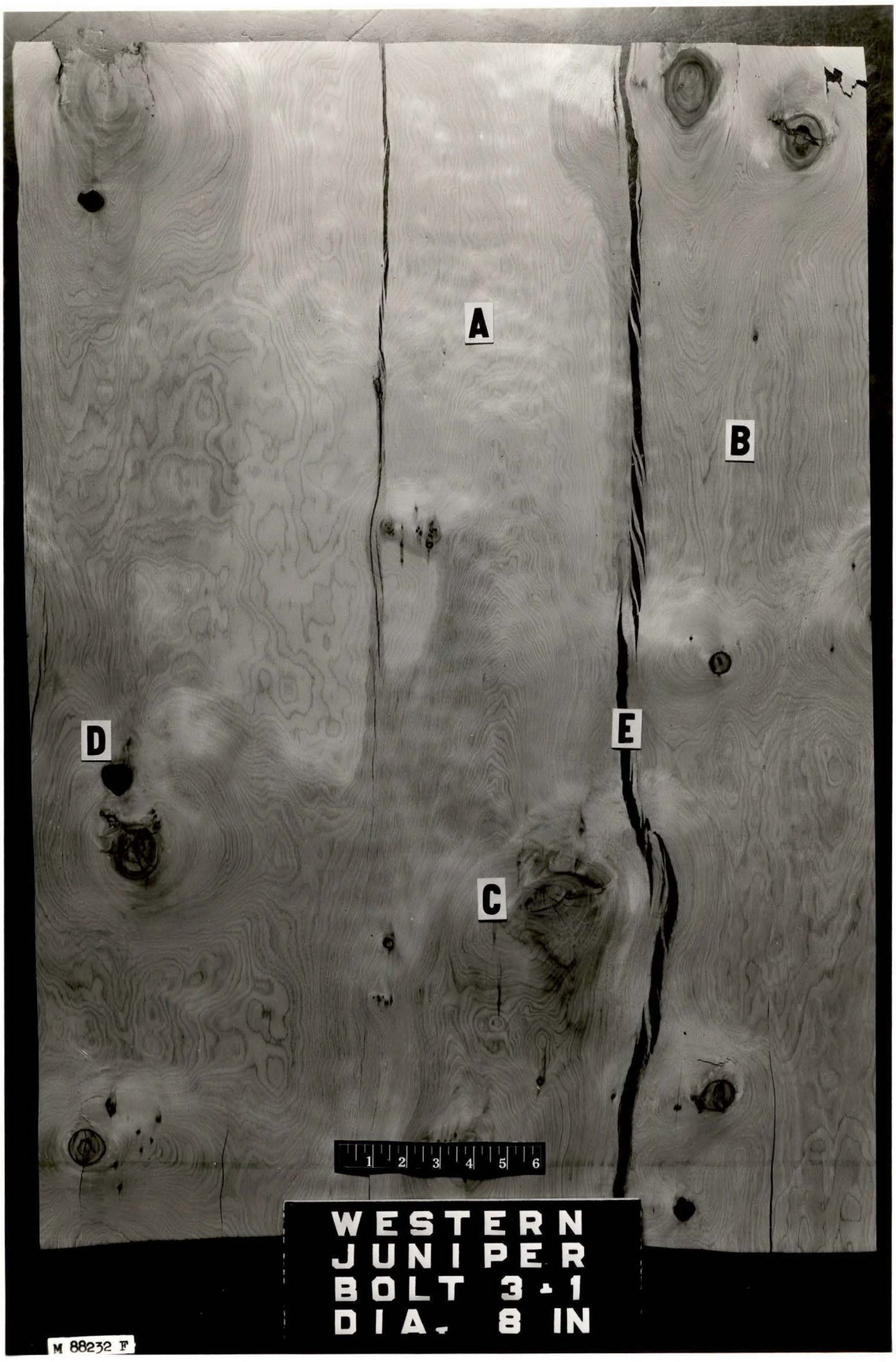
A
B
C
D
E
1 2 3 4 5 6
WESTERN
JUNIPER
BOLT 3-1
DIA. 8 IN
M 88232 F

Figure 7. - Sheets of 1/22-inch sliced Utah juniper veneer showing sound sapwood and heartwood, live and dead knots, and split resulting from cross grain at intergrown knot. The open tears at top of left sheet and bottom of right sheet due to intergrown bark pockets.

Figure 8. - Sheets of sliced alligator juniper veneer showing sound sapwood and heartwood with large knots and bark-encased small knots. Checking starting at knots and adjacent short-grained wood.

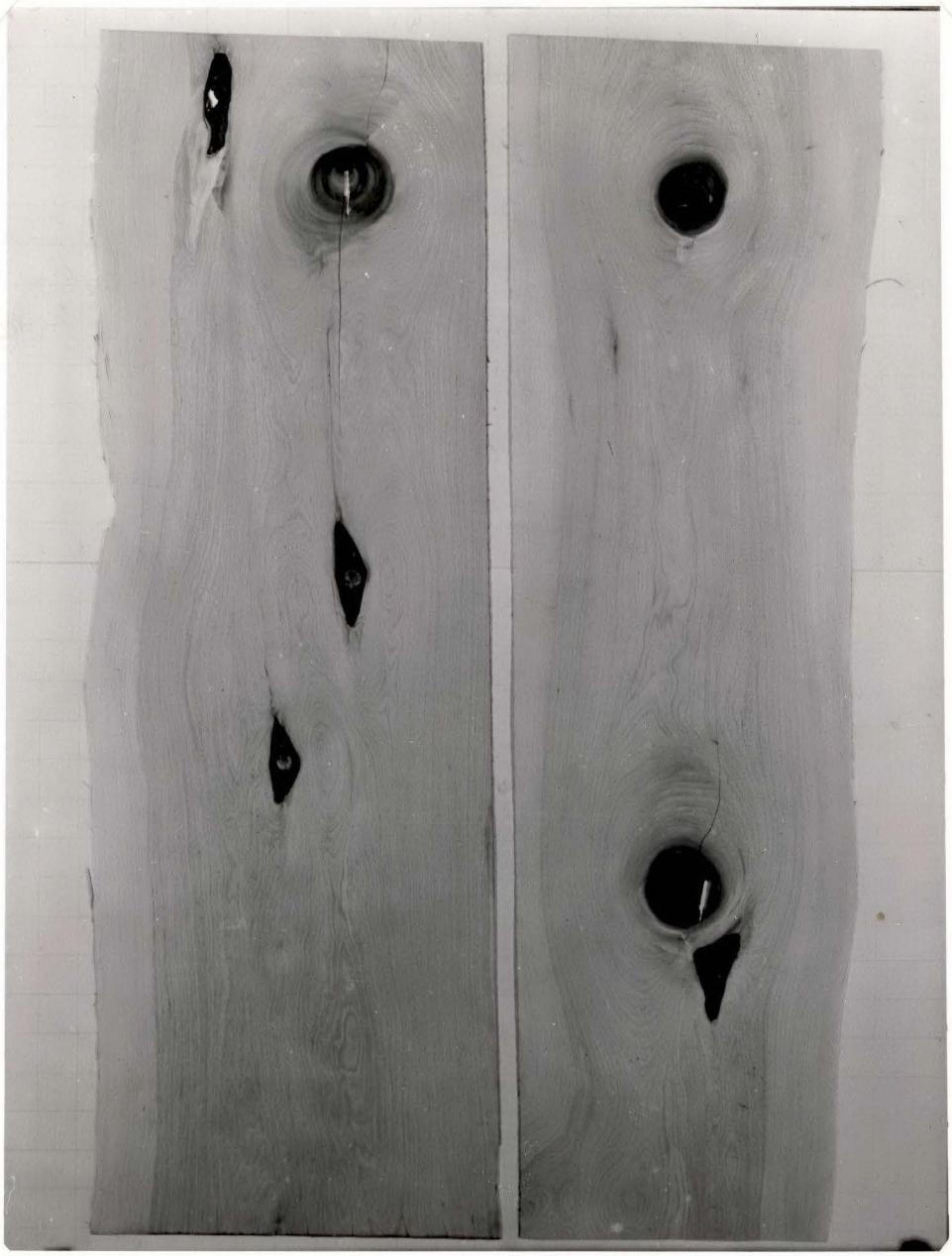

Figure 9. - Sliced alligator juniper (left), Utah juniper (center), and eastern redcedar (right) sliced veneer showing comparison between species.